Thermal System Design MEEN-4360
Department of Science and Engineering
Spring 2020

A. COURSE INFORMATION
   Course number/section: MEEN 4360.001
   Class meeting time: 9:30 – 10:45AM TR
   Class location: EN 101
   Course Website:

B. INSTRUCTOR INFORMATION
   Instructor: Professor Jian Sheng
   Office location: EN 313
   Office hours: MW 3pm-6pm
   Office Telephone: 361-825-3731
   e-mail: jian.sheng@tamucc.edu
   Appointments: Correspond using ISLANDER EMAIL.

C. COURSE DESCRIPTION
   Analysis, management and cost, optimal design, and computer simulation of thermal systems and components; Applications in fluid flow and heat transfer, pumps, turbines and heat exchangers. Selected course topics are assigned as projects.

D. PREREQUISITES AND COREQUISITES
   MEEN 3345 Heat Transfer (Implies that Fluids (ENGR 3315) has been taken)
   Corequisites
   None

E. REQUIRED TEXTBOOK(S), READINGS AND SUPPLIES
   Optional Textbook(s) or Other References
     •  Thermodynamics: An Engineering Approach, 8th Edition, Cengel and Boyles, McGraw Hill
     •  Texts used by students in Fluids, ENGR 3315 and Heat Transfer, MEEN 3345
   Supplies
     None

F. STUDENT LEARNING OUTCOMES AND ASSESSMENT
Assessment is a process used by instructors to help improve learning. Assessment is essential for effective learning because it provides feedback to both students and instructors. A critical step in this process is making clear the course’s student learning outcomes that describe what students are expected to learn to be successful in the course. The student learning outcomes for this course are listed below. By collecting data and sharing it with students on how well they are accomplishing these learning outcomes students can more efficiently and effectively focus their learning efforts. This information can also help instructors identify challenging areas for students and adjust their teaching approach to facilitate learning.

By the end of this course, students should be able to:

1. Students will demonstrate the ability to apply first law and second law analyses to thermal systems at the system and down to the component level.
2. Students will demonstrate the ability to perform psychrometrics and HVAC calculation.
3. Students will demonstrate the ability to perform combustion calculation.
4. Students will demonstrate the ability to perform heat exchanger calculation.
5. Students will demonstrate the ability to use performance indicators to size components such as piping, heat exchangers, pumps to name some examples.
6. Students will apply knowledge gained to a case study subject to multiple constraints, including economic evaluation and life-cycle assessment.

G. INSTRUCTIONAL METHODS AND ACTIVITIES

Lectures, group discussions, home assignments, spreadsheet based calculations, textbook software for computer-aided solutions. The student is expected to have read/review the chapter before coming to the class.

H. MAJOR COURSE REQUIREMENTS AND GRADING

<table>
<thead>
<tr>
<th>ACTIVITY</th>
<th>% of FINAL GRADE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exams (2 @ 20% each)</td>
<td>40</td>
</tr>
<tr>
<td>Homework/In class/misc &amp; Attendance</td>
<td>20</td>
</tr>
<tr>
<td>Mini Projects (Team)</td>
<td>10</td>
</tr>
<tr>
<td>Project Proposal &amp; Presentations (5%) (Team)</td>
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<tr>
<td>Project Written Reports(progress reps (3) (5%), final report 15)% (portion of grade will be determined by peer evaluation)</td>
<td>30</td>
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Grading Scale: A = 100-87; B = 77-87; C = 67-76; D = 57-66; F = below 57

I. COURSE CONTENT/SCHEDULE

TENTATIVE SCHEDULE
J. COURSE POLICIES

**Attendance/Tardiness**
Roll be taken on a daily basis and will be used to at end of semester.

**Homework:** Students may be asked to submit assigned problems at the time of each exam in a single folder. The folder will have the student’s name on it and homework relative to the week assigned will be divided by either a staple, or a tab. Assessment of work will be based on whether or not homework format is followed, completeness of work, and problems worked. The student is urged to work the homework in a timely fashion and maintain the homework folder through the term.

**Mini-Projects:** There will be some assignments that will be mini-group assignments. These will be turned in on assigned dates. Mini groups might consist of two people or up to 4 people.

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<table>
<thead>
<tr>
<th>Week</th>
<th>Topic*</th>
<th>Activity</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction &amp; Systems Overview Systems &amp; design and Review 1st and 2nd Law of Thermodynamics</td>
<td>HW1</td>
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<tr>
<td>2</td>
<td>Thermodynamic Properties &amp; Exergy</td>
<td>HW2</td>
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<tr>
<td>3</td>
<td>Exergy Analysis II &amp; Economics I</td>
<td>HW3</td>
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<tr>
<td>4</td>
<td>Economics II, Power Cycles I</td>
<td>HW4</td>
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<tr>
<td>5</td>
<td>Power Cycles II, Review of Fluid Fundamentals</td>
<td>HW5</td>
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<tr>
<td>6</td>
<td>Fluid Fundamentals II, Review, Project</td>
<td>HW6, Proposal</td>
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<tr>
<td>7</td>
<td>Exam 1, Cycles: Refrigeration &amp; Heat Pumps</td>
<td>Exam 1,</td>
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<td>8</td>
<td>Gas Mixtures/psychometrics &amp; HVAC I</td>
<td>HW7,</td>
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<tr>
<td>9</td>
<td>HVAC II, Heat Exchangers I</td>
<td>HW8</td>
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<tr>
<td>10</td>
<td>Heat Exchangers II, Heat Exchangers III</td>
<td>HW9, Prog. Rep 1</td>
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<tr>
<td>11</td>
<td>Thermal System Modeling I, Case Study</td>
<td>HW10</td>
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<tr>
<td>12</td>
<td>Thermal System Modeling II, Combustion I</td>
<td>HW11, Prog. Rep 2</td>
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<tr>
<td>13</td>
<td>Combustion II</td>
<td>HW12</td>
</tr>
<tr>
<td>14</td>
<td>Review/Exam 2</td>
<td>HW13, Exam 2, Prog Rep 3</td>
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<tr>
<td>FE</td>
<td>Open topics/Case Study/Project overview</td>
<td>Final Report Due</td>
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* Lectures may be shifted depending on introduction of case studies as well as possible speakers brought to class. Schedule changes will be posted on BlackBoard through the Announcement Posts.

Note: Changes in this course schedule may be necessary and will be announced to the class by the Instructor and posted on Blackboard announcements. The assignments and exams shown are directly related to the Student Learning Outcomes described in Section F.
Exams:
- May be open or closed book and notes; you will be provided with the needed equations for the exam if closed book.
- Combination of concept questions (fill in blank, TF, multiple choice, short answer) and workout problems.
- Only calculators (recommend ones that can interpolate) are allowed. No smart devices, tablets, computers, etc are allowed.
- Make up exams will only be allowed with a valid (university approved) excuse.

Late Work and Make-up Exams
Missed Exam & Quizzes
Make up exams will only be allowed with a valid (university approved) excuse. Exams need to be made up with one week from when exam was first administered
Make up quizzes will be at the discretion of the instructor if missed quiz does not fall under university approved absence. However, each student will be granted one missed quiz for the term. Make up quizzes will not be the same as what was given in class and need to be made up within one week from missed time.

Extra Credit
No extra credit is planned.

Cell Phone Use
Use of the phone during class can only be for emergency purposes only. If you have a possible need, alert instructor ahead of time and put device on vibrate. Family medical emergency could fall under this category. Research or job interview calls do not. Also, no recording of the lectures is allowed without express written consent of the instructor or expressed authorization by disability services

Laptop Use
In general, use of laptop is not permitted during class unless instructed to. There may be times when access to a computational tool maybe needed.

Food in Class
No eating or drinking is permitted in class.

Emailing: Must use your Islander Email. Preferred contact is through Blackboard messaging. If emailing, must include course number and section in subject heading as well as purpose of email. Example: MEEN4360.001: Missed quiz 10.
Participation
Students are expected to play an active role in class in asking questions, answering questions. In addition, professional conduct is expected too. This is particular so in regards to use of smart devices. A brief lapse in attention might result in the missing of important content for a quiz or exam.

Others
Blackboard will be used through the semester to provide access to notes, example problems, and notifications regarding quizzes, homework, exams, projects, and so forth. Folders for group projects will be provided on Blackboard so that files can be shared as well as submitted.

K. COLLEGE AND UNIVERSITY POLICIES

- Academic Integrity (University)
  University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or test will result in a failing grade.

- Classroom/Professional Behavior
  Texas A&M University-Corpus Christi, as an academic community, requires that each individual respect the needs of others to study and learn in a peaceful atmosphere. Under Article III of the Student Code of Conduct, classroom behavior that interferes with either (a) the instructor’s ability to conduct the class or (b) the ability of other students to profit from the instructional program may be considered a breach of the peace and is subject to disciplinary sanction outlined in article VII of the Student Code of Conduct. Students engaging in unacceptable behavior may be instructed to leave the classroom. This prohibition applies to all instructional forums, including classrooms, electronic classrooms, labs, discussion groups, field trips, etc.

- Statement of Civility
  Texas A&M University-Corpus Christi has a diverse student population that represents the population of the state. Our goal is to provide you with a high quality educational experience that is free from repression. You are responsible for following the rules of the University, city, state and federal government. We expect that you will behave in a manner that is dignified, respectful and courteous to all people, regardless of sex, ethnic/racial origin, religious background, sexual orientation or disability. Behaviors that infringe on the rights of another individual will not be tolerated.

- Deadline for Dropping a Course with a Grade of W (University)
  The grade of W will be assigned to any student officially dropping a course. Please consult with the instructor before you decide to drop to be sure it is the best thing to do. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. Should dropping the course be the best course of action, visit the
Office of the University Registrar for the Course Drop Form that must be submitted. No student is eligible to receive a W without completing the official drop process by this deadline. Please consult the Academic Calendar (http://www.tamucc.edu/academics/calendar/) for the last day to drop a course.

**Grade Appeals (College of Science and Engineering)**

As stated in University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules website at http://www.tamucc.edu/provost/university_rules/index.html, and the College of Science and Engineering Grade Appeals webpage at http://sci.tamucc.edu/students/GradeAppeal.html. For assistance and/or guidance in the grade appeal process, students may contact the chair or director of the appropriate department or school, the Office of the College of Science and Engineering Dean, or the Office of the Provost.

**Disability Services**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call (361) 825-5816 or visit Disability Services in Corpus Christi Hall 116.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816. [http://disabilityservices.tamucc.edu/](http://disabilityservices.tamucc.edu/)

**Statement of Academic Continuity**

In the event of an unforeseen adverse event, such as a major hurricane and classes could not be held on the campus of Texas A&M University–Corpus Christi; this course would continue through the use of Blackboard and/or email. In addition, the syllabus and class activities may be modified to allow continuation of the course. Ideally, University facilities (i.e., emails, web sites, and Blackboard) will be operational within two days of the closing of the physical campus. However, students need to make certain that the course instructor has a primary and a secondary means of contacting each student.

### L. OTHER INFORMATION

- **Academic Advising**

  The College of Science & Engineering requires that students meet with an Academic
Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a
degree plan, which must be signed by the student, a faculty mentor, and the department
chair. Meetings are by appointment only; advisors do not take walk-ins. Please call or stop
by the Advising Center to check availability and schedule an appointment. The College’s
Academic Advising Center is located in Center for Instruction 350 or can be reached at
(361) 825-3928.

GENERAL DISCLAIMER

I reserve the right to modify the information, schedule, assignments, deadlines, and course policies
in this syllabus if and when necessary. I will announce such changes in a timely manner during
regularly scheduled lecture periods.